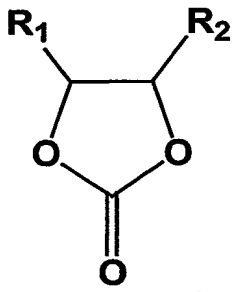
Claims

1. A composition for forming a polyurethane polymeric compositions comprising
   (a) a polymerisable organic material that bears at least one cyclocarbonate group or a mixture thereof;
   (b) a natural or synthetic, modified or unmodified nano-clay [ionic phyllosilicate] with a platelet thickness of less than 25 Å (~2.5 nm), more preferable less than 10 Å (~1 nm), and most preferably between 4-8 Å (~0.5-0.8 nm) and an aspect ratio (length/thickness) higher than 10, more preferably higher than 50 and most preferably higher than 100) or a mixture thereof or a nanocomposite formed from such a nano-clay, preferably the nano-clay is a natural or modified montmorillonite; and
   (c) at least one hardener for component (a), which preferably is a primary and/or secondary amine or a mixture thereof.

2. A composition as claimed in claim 1, which further includes least one polymerisable organic material that bears at least one epoxy group (component (d)) and a hardener therefor.

3. A composition as claimed in claim 1 or claim 2, wherein component (a) is a compound of the general formula I:



(I)

where R_1, R_2 can each independently be hydrogen, or a linear, branched, cyclic (aromatic/heteroaromatic/cycloaliphatic), saturated or unsaturated (e.g. vinyl, (meth)acrylate moieties, etc.) group and can also contain heteroatoms (e.g. silicon) or more preferably oxygen-containing groups (e.g. terminal or linking further 1,3-dioxolan-2-one rings, epoxy rings, or ester, ether, carboxyl groups, or hydroxy) and/or nitrogen (e.g. terminal or linking amino, imino, tertiary coordinated nitrogen).

4. A composition as claimed in claim 1, 2 or 4, wherein component (b) is present in an amount of from 0.1 to 95%, preferably 1 to 40%, more preferably 2 to 30%, e.g. 4 to 20%, w/w based on the total weight of the composition.

5. A composition as claimed in any one of claims 1 to 4, wherein the nano-clay has aspect ratio (length/thickness) higher than 10, more preferably higher than 50 and most preferably higher than 100 or a nanocomposite containing such a nanoclay.

6. A composition as claimed in any one of claims 1 to 5, wherein the thickness of the nano-clay platelets is less than 10 Å (~1 nm) and most preferably in between 5-8 Å (~0.5-0.8 nm) or a nanocomposite containing such a nanoclay.

7. A composition as claimed in any one of claims 1 to 6, wherein the nano-clay is an ionic natural, synthetic or modified phyllosilicate, preferably a natural or modified bentonite, saponite, hectorite, montmorillonite or synthetic mica fluoride or a nanocomposite containing such a nanoclay.

8. A composition as claimed in claim 7, wherein the nano-clay is a natural or modified montmorillonite or a nanocomposite containing such a nanoclay.

9. A composition as claimed in any one of claims 1 to 8, additionally containing reinforcement fibres e.g. glass, carbon, basalt, fibres and/or other toughening agents, and mixtures thereof.

10. A composition as claimed in any one of claims 1 to 9, additionally containing fillers and/or pigments, e.g. metal oxides, metal hydrates, metal hydroxides, metal aluminates, metal carbonates metal sulphates, metal silicates, various starches, talcs, kaolins, molecular sieves, fumed silica, organic pigments, zinc or calcium borates/stannates/molybdates, ammonium molybdates, calcium hydroxide, aluminium trihydroxide, silicon oxide, silicon nitride, boron nitride, sodium metalsilicate pentahydrate, potassium tetraborate tetrahydrate, magnesium hydroxide, magnesium silicates, titanium oxide.

11. A composition as claimed in any one of claims 1 to 11, additionally containing drying agents (e.g. tolylene diisocyanate), stabilizers, and/or surface tension modifiers.

12. A composition as claimed in any one of claims 1 to 11, additionally containing a solvent or a solvent mixture.

13. A composition as claimed in any one of claims 1 to 12, additionally containing a diluent or a diluent mixture.

14. Use of the compositions as claimed in any one of claims 1 to 13, in the preparation of adhesives, sealants, paints/coatings, casting resins, reinforcing or thixotropic agents, cables, in shapable moulding materials and in finished mouldings or in composite materials.

15. A method of forming a polyurethane-based polymer comprising curing a composition as claimed in any one of claims 1 to 13.